

## Low Cost Approach to (MESUR) Pathfinder and Network

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### Abstract

After completion of a global survey of Mars with orbiters achieving Mars Observer objectives, the next step in Mars exploration will be with small landers, accomplishing Geoscience, Meteorology and Seismology investigations,

Pathfinder, launching in December '96 and landing July 4, '97, will demo a low cost delivery system to the surface of Mars for future small landers. Historically, spacecraft that orbit around or land on a distant body carry a large amount of fuel for braking. Pathfinder, thrusting only for navigation to Mars, aerobrakes into the Mars atmosphere, deploys a parachute at 10 km above the surface and, within 100 m off the surface, lights off solid rockets for final braking prior to deployment of airbags which cushion touchdown. After landing, petals open to upright the lander,

The major objective of Pathfinder, telemetering of engineering data on EDL and lander performance, will occur within the first day of landed operations. In addition, the lander will transmit a portion of a panoramic image of the Martian surface this day. Next, the micro-rover will be deployed to accomplish mobility tests, image its surroundings including the lander, and place the APX against a rock to make elemental composition measurements.

**The primary mission durations for the micro-rover and lander are one week and one month, respectively.** However, both are expected to operate longer.

While Pathfinder is an engineering demo, it accomplishes a focused, exciting set of science investigations with a stereo, multi-spectral color lander imager; atmospheric instrumentation, used as a weather station after landing; the APX; and the rover including its cameras,

This paper features Pathfinder's approach to innovative and cost effective mission accomplishment, capped at 150 Mil \$ (FY '92) for development. Pathfinder is pathfinding a new way of doing business at JPL for small, low cost, Discovery class missions.

In addition, the approach to small lander missions after Pathfinder will be addressed, in particular: the importance of Pathfinder to these missions, the challenges of project acquisition and implementation in today's environment, the unique challenges of small lander missions executing MESUR Network mission objectives, and how cost effective mission requirements are being established with the science community,

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MESUR = Mars Environmental SURvey  
APX = Alpha Proton X-Ray Spectrometer  
EDL = Entry, Descent, Landing

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